

INTERVIEW SUMMARY

Applicants wish to thank Examiner Johnson for the courtesies extended to Applicants' representative at the interview held on May 31, 2005. At that time, Applicants' representative discussed the differences between the preparation of the multimetal oxide material of the claimed invention and the multimetal oxide materials disclosed in the prior art references cited in the Office Action. The Examiner suggested that Applicants consider amending the claims to clarify and recite active process steps to better distinguish the claimed invention over the cited prior art references in the Office Action. The following remarks further expand upon the discussion with the Examiner.

REQUEST FOR RECONSIDERATION

The claimed invention specifically relates to a process for preparing a multimetal oxide material M of the stoichiometry I:



in which each of  $\text{M}^1$ ,  $\text{M}^2$ , and  $\text{M}^3$  is at least one of the elements selected from the groups defined in the claim 1, the multimetal oxide material M has a specific X-ray diffraction pattern, such that there is **no reflection having the peak position  $2\theta = 50.0 \pm 0.3^\circ$** ; and in which the process comprises washing the multimetal oxide material M with a liquid selected from the group consisting of organic acids, inorganic acids, solutions of organic acids, solutions of inorganic acids and mixtures thereof. In addition, there is no precursor multimetal oxide material of the multimetal oxide material M that is washed with a liquid selected from the group consisting of organic acids, inorganic acids, solutions of organic acids, solutions of inorganic acids, solutions of inorganic acids and mixtures thereof.

In general, multimetal oxide materials are suitable as catalysts for heterogeneously catalyzed partial gas-phase oxidations and/or ammoxidations of saturated and unsaturated hydrocarbons. If propane and/or propene are used as the hydrocarbon, for example, acrolein, acrylic acid and/or acrylonitrile can be produced as target compounds. These catalysts are key intermediates which are used, for example, for the preparation of polymers which can be employed as various products, such as adhesives.

Conventionally, the preparation of a multimetal oxide material M is carried out in a systematic manner. First, a precursor multimetal oxide material differing from a multimetal oxide material M, whose X-ray diffraction pattern has a reflection having a secondary phase at the peak position  $2\theta = 50.0 \pm 0.3^\circ$ , is produced. The precursor multimetal oxide material is then washed with a liquid from the group consisting of organic acids, inorganic acids, solutions of organic acids, solutions of inorganic acids and mixtures thereof.

In a less systematic manner, a multimetal oxide material M is obtained directly by producing a very intimate, preferably finely divided dry blend from sources (starting compounds) of their elemental constituents, and then converting the dry blend by thermal treatment into an active multimetal oxide M, without the above-mentioned washing processing.

However, a disadvantage of such directly obtained multimetal oxide materials M is that the selectivity of the formation of the target compound can be not completely satisfactory when they are used as catalysts for heterogeneously catalyzed partial gas-phase oxidations and/or ammoxidations of saturated and/or unsaturated hydrocarbons.

The present inventors have found that the process of the claimed invention substantially reduces or completely eliminates this disadvantage of directly obtained multimetal oxide materials M. The claimed process yields multimetal oxide materials that are more efficient for the selective formation of target compounds, such as acrylic acid, when they used as catalysts for heterogeneously catalyzed partial gas-phase oxidations and/or ammoxidations of saturated and unsaturated hydrocarbons.

Accordingly, reconsideration of the claimed invention is respectfully requested.

The rejections under 35 U.S.C. § 103(a) of claims 1-6 over: 1) U.S. Patent No. 6,642,173 to Bogan, Jr. (“U.S. ‘173) in view of U.S. Patent No. 6,610,629 to Hinago et al. (“U.S. ‘629”), U.S. Patent No. 6,734,136 to Chaturvedi et al. (“U.S. ‘136”), U.S. Patent No. 6,589,907 to Chaturvedi et al. (“U.S. ‘907”), U.S. Patent No. 6,407,280 to Chaturvedi et al. (“U.S. ‘280”), U.S. Patent No. 6,407,031 to Chaturvedi et al. (“U.S. ‘031”), U.S. Patent No. 6,383,978 to Bogan, Jr. (“U.S. ‘978”), and U.S. 6,403,525 to Chaturvedi et al. (“U.S. ‘525”); and 2) WO 02/06199 to Borgmeier et al. (the U.S. equivalent of which is U.S. Published Patent Application 2003/0187298) (“U.S. ‘298”) in view of the above-recited secondary references are respectfully traversed.

I. The U.S. ‘173 and U.S. ‘298 primary references do not describe or suggest the specific multimetal oxide material M prepared by the process of the claimed invention.

A. The U.S. ‘173 reference

The U.S. ‘173 reference generally discloses a multimetal oxide catalyst for the oxidation of alkanes to their corresponding unsaturated carboxylic acids. The metal oxide has the general empirical formula  $A_aV_bN_cX_dO_e$  (column 3, lines 58-64). However, none of the possible variations of metal oxide materials require the simultaneous presence of all of the elements recited in the claimed formula (I) as follows:  $Mo_1V_aM^{1\ b}M^{2\ c}M^{3\ d}O_n$  (I). In particular, the formulae of the disclosed metal oxide materials do not require the simultaneous presence of  $M^2$  and  $M^3$ . For instance, the reference only recites that “the empirical formulae  $Mo_aV_bTe_cNb_dO_e$  or  $W_aV_bTe_cNb_dO_e$ ” are preferred (column 5, lines 53-55). Moreover, Applicants note that Examples 1-3 disclosed in the reference only demonstrate metal oxide materials having Mo, V, one  $M^1$  and one  $M^2$  as metallic constituents. As such, there is clearly no description or suggestion that the specific multimetal oxide material M of the claimed invention would be produced by a process described in the reference. In view of the lack description or suggestion of the claimed

multimetal oxide material M, the claimed invention would not be obvious in view of the U.S. ‘173 reference.

B. The U.S. ‘298 reference

The U.S. ‘298 reference generally discloses a method for preparing a multimetal oxide catalyst of the following formula (I):  $\text{Mo}_1\text{V}_b\text{M}^1\text{cM}^2\text{dO}_n$  (I) at paragraph [0001] (emphasis added). However, the process disclosed in the reference at paragraphs [0050] – [0054] does not explicitly include the preparation of a multimetal oxide material M that separately includes  $\text{M}^3$  as a metallic constituent, as presently claimed.

Applicants note the Examiner’s assertion that the material in reference may include other elements, because of the recitation of the phrase “at least one” in the reference’s disclosure. However, the reference only recites the phrase when referring to  $\text{M}^2$  (see, e.g., paragraph [0004]). In contrast, the claimed invention recites the phrase **at least one** when referring to both  $\text{M}^2$  and  $\text{M}^3$  (see present claim 1, above). As such, the multimetal oxide material M of the claimed invention can clearly have more metal constituents than the reference, and therefore would not be obvious.

II. The secondary references to Chaturvedi et al. and Bogan, Jr. do not cure the deficiencies of U.S. ‘173 and U.S. ‘298, since there is no evidence or suggestion that it would have been obvious to modify the references for the preparation of the multimetal oxide material M of the claimed invention.

A. The U.S. ‘629 reference

The U.S. ‘629 reference generally discloses a process for preparing a multimetal oxide for use as a catalyst having the following formula (I):  $\text{MO}_{1.0}\text{V}_a\text{X}_b\text{Nb}_c\text{Z}_d\text{O}_n$  (column 6, line 17) (emphasis added). However, as shown at line 38 of column 6,  $\text{Z}_d$  may or may not be present in the multimetal oxide material (i.e., no requirement of the simultaneous presence of

**M<sup>3</sup>** of the claimed invention). Applicants also note that none of the Examples in the reference exemplify a multmetal oxide having **M<sup>3</sup>**. Moreover, there is no description whatsoever of any of the details of specific X-Ray diffraction pattern recited in the claimed invention.

B. The U.S. ‘136 reference

The U.S. ‘136 reference generally discloses a multmetal oxide catalyst for the oxidation of alkanes or a mixture of alkanes and alkenes having the empirical formula A<sub>a</sub>M<sub>b</sub>N<sub>c</sub>X<sub>d</sub>Ir<sub>e</sub>Sm<sub>f</sub>O<sub>g</sub> (column 4, lines 23-26). However, the reference explicitly discloses that one of the “five main **diffraction peaks** at specific diffraction angles 2θ in the X-ray diffraction pattern” of the catalyst is at **50.0 ± 0.3°** (column 7, lines 10-36) (emphasis added). The specific peaks are shown in the table in column 7, a portion of which is reproduced below.

<u>X-Ray lattice plane</u>		
Diffraction angle <u>2θ</u>	Spacing medium Å	Relative intensity
50°	1.82	2-40

In contrast, the claimed invention recites the preparation of the multmetal oxide material M with “no reflection having the peak position 2θ = 50.0 ± 0.3°” (present claim 1) (emphasis added).

C. The U.S. ‘907, U.S. ‘280, and U.S. ‘031 references

Each of the U.S. ‘907, U.S. ‘280, and U.S. ‘031 references generally discloses multmetal oxide catalysts that are similar to the U.S. ‘136 reference. In addition, in each instance the references recite that the multmetal oxide catalysts have **a peak position 2θ at 50.0 ± 0.3°**. Applicants note that the portion of the table, reproduced above from U.S. ‘136, is exactly shown in each reference (see column 7, lines 1-30 of U.S. ‘907, column 6, lines 41-66 of U.S. ‘031, and column 6, line 62 - column 7, line 21 of U.S. ‘280). As discussed above,

Application No. 10/647,335  
Reply to Office Action of March 22, 2005

the claimed mult metal oxide material M differs from these references because it specifically does not include the peak position  $2\theta = 50.0 \pm 0.3^\circ$ .

D. The U.S. '978 and U.S. '525 references

Both the U.S. '978 and U.S. '525 reference discloses a mult metal oxide catalyst having the general empirical formula  $Mo_aV_bN_cX_dZ_eO_f$  (see, e.g., column 3, lines 30-33 of U.S. '978; and column 4, lines 15-19 of U.S. '525). However, there is no description or evidence whatsoever of the preparation of a catalyst having the specific X-ray diffraction pattern of the claimed invention.

Thus, as the above-discussed secondary references do not remedy the deficiencies of U.S. '173 and U.S. '298 references, and there is no evidence whatsoever that one would selectively piece together the claimed invention based on their disclosures, the claimed invention is not obvious in view of the combined references.

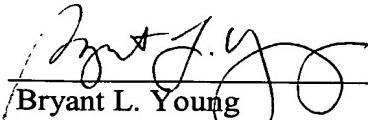
Thus, in view of the foregoing reasons, Applicants respectfully request the withdrawal of the rejections under 35 U.S.C. § 103(a).

The objection of claims 7-11 under 37 C.F.R. § 1.75(c), as being in improper form because of improper multiple dependencies, is obviated by amendment.

Applicants submit that the application is now in condition for allowance. Early notification of such allowance is earnestly solicited.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,  
MAIER & NEUSTADT, P.C.  
Norman F. Oblon

  
Bryant L. Young  
Registration No. 49,073

Customer Number  
**22850**

Tel: (703) 413-3000  
Fax: (703) 413 -2220  
(OSMMN 06/04)